AF/J.F64

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Stephen F. Rutkowski et al.	§	Group Art Unit: 1734
Serial No.: 10/622,063	§	Examiner: Koch, George R.
Filed: July 17, 2003	§	
For: ROBOTIC PEN	§	Atty. Docket: 126762-1/YOD GERD:0333

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August 17, 2006 — Lynda Howell
Date

RESPONSE TO NOTICE OF NON-COMPLIANT APPEAL BRIEF AND AMENDMENT

In response to the Notice of Non-Compliant Appeal Brief mailed on January 9, 2006, Applicants resubmit herewith the Appeal Brief which now is believed to accommodate the objectionable details of the Notice.

Respectfully submitted,

Date: 8/17/2006

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APPEAL BRIEF PURSUANT TO 37 C.F.R. §§ 41.31 AND 41.37 AND REPLY TO THE NOTICE OF NON-COMPLIANT APPEAL BRIEF

This Appeal Brief is being filed in furtherance to the Notice of Appeal mailed on April 19, 2006, and received by the Patent Office on April 25, 2006. A Pre-Appeal Brief Request for Review was filed in the Office, resulting in a Panel Decision mailed on June 6, 2006. Accordingly, the present Brief is due to be mailed to the Office on July 6, 2006. This is also in Reply to the Notice of Non-Compliant Appeal Brief mailed on August 2, 2006.

The Commissioner is authorized to charge the requisite fee of $500.00, and any additional fees which may be necessary to advance prosecution of the present application, to Account No. 07-0868, Order No. 126762-1/YOD (GERD:0333).

1. **REAL PARTY IN INTEREST**

The real party in interest is General Electric Company, the Assignee of the above-referenced application by virtue of the Assignment to General Electric Company by Stephen F. Rutkowsk, Canan U. Hardwicke, Michael F. X. Gigliotti, and Melvin R. Jackson, recorded at Reel 014319, Frame 0210, and dated July 17, 2003. Accordingly, General Electric Company, as the parent company of the Assignee of the above-referenced application, will be directly affected by the Board's decision in the pending appeal.

2. **RELATED APPEALS AND INTERFERENCES**

Appellants are unaware of any other appeals or interferences related to this Appeal. The undersigned is Appellants' legal representative in this Appeal.

3. **STATUS OF CLAIMS**

Claims 1-6, 11-12, and 17-26 are currently. In the Final Office Action maled on May 24, 2005, claims 1-3, 11 an 24 were rejected, and claims 4-6, 12, 17-23 and 25-26 were objected to.

4. **STATUS OF AMENDMENTS**

The Appellants have not submitted any amendments subsequent to the Final Office Action mailed on May 24, 2005. Consequently, there are no outstanding amendments to be considered by the Board.

5. **SUMMARY OF CLAIMED SUBJECT MATTER**

The present invention relates generally to manufacturing and repairing of articles. *See* Application, page 1, paragraph 1. More particularly, in certain embodiments, the invention relates to dispensing or writing a material stream in desired patterns. *See id.*

The Application contains three independent claims, namely, claims 1, 11, and 24, all of which are the subject of this Appeal. The subject matter of these claims is summarized below.

With regard to the aspect of the invention set forth in independent claim 1, discussions of the recited features of claim 1 can be found at least in the below cited locations of the specification and drawings. By way of example, the claimed machine includes a three axis stage for mounting the workpiece sample (*e.g.,* 14) for two-axis (*e.g.,* X, Y) precision translation and precision rotation (*e.g.,* A) relative thereto. The machine also includes an elevator (*e.g.,* 20) on which is mounted a rotary spindle (*e.g.,* 22), shown in part, in which various milling machine tools may be interchanged for use in, typically in milling of workpieces. The elevator introduces a vertical axis (*e.g.,* Z) of translation relative to the workpiece stage (*e.g.,* 18), with the three axes of translation (*e.g.,* X, Y, Z) and one rotary axis (*e.g.,* A) being used for performing milling of various 3D workpieces. *See, e.g., id.* at page 3, paragraph 15; *see also* FIG. 1.

The machine (*e.g.,* 16) is modified in constructing the robotic pen by removing most if not all of the milling tool spindle (*e.g.,* 22) from the elevator, and replacing the spindle with a rotary pen tip or nozzle (*e.g.,* 24) which is suitably rotatably mounted to the elevator (*e.g.,* 20). *See, e.g., id.* at page 3, paragraph 15; *see also* FIG. 1. Means in the form of a dispenser (*e.g.,* 26) are suitably joined in flow communication with the pen tip (*e.g.,* 24) for ejecting desired material (*e.g.,* 12) in a stream atop the workpiece for writing thereon any suitable pattern of material under relative movement between the pen tip and the workpiece mounted to the stage (*e.g.,* 18). *See, e.g., id.* at page 3, paragraph 15; *see also* FIG. 1. The machine also includes a digitally programmable computer or controller (*e.g.,* 36) which is configured in software for controlling all motion axes of the machine, including the relative movement of the pen tip (*e.g.,* 24) mounted on the elevator and the workpiece mounted on the movable stage (*e.g.,* 18) as the material stream (*e.g.,* 12) is dispensed from the pen tip. In particular, the controller (*e.g.,* 36) is effective for controlling and coordinating relative

movements along the three linear axes (*e.g.*, X, Y, Z) and the two rotary axes (*e.g.*, A, B). *See, e.g., id.* at page 4, paragraphs 21-22; *see also* FIG. 1.

With regard to the aspect of the invention set forth in independent claim 11, discussions of the recited features of claim 11 can be found at least in the below cited locations of the specification and drawings. A main component of the robotic pen is a computer numerically controlled (CNC) milling machine (*e.g.*, 16) having multiple axis motion capability. *See, e.g., id.* at page 3, paragraph 14; *see also* FIG. 1. The machine includes a three axis stage (*e.g.*, 18) for mounting the workpiece sample (*e.g.*, 14) for two-axis (*e.g.*, X, Y) precision translation and precision rotation (*e.g.*, A) relative thereto. The machine also includes an elevator (*e.g.*, 20) on which is mounted a rotary spindle (*e.g.*, 22), shown in part, in which various milling machine tools may be interchanged for use in typical milling of workpieces. *See, e.g., id.* at page 3, paragraph 15; *see also* FIG. 1. Means in the form of a dispenser (*e.g.*, 26) are suitably joined in flow communication with the pen tip (*e.g.*, 24) for ejecting desired material (*e.g.*, 12) in a stream atop the workpiece for writing thereon any suitable pattern of material under relative movement between the pen tip and the workpiece mounted to the stage (*e.g.*, 18). *See, e.g., id.* at page 3, paragraph 15; *see also* FIG. 1.

With regard to the aspect of the invention set forth in independent claim 24, discussions of the recited features of claim 24 can be found at least in the below cited locations of the specification and drawings. Here again, a main component of the robotic pen of claim 24 is a computer numerically controlled (CNC) milling machine (*e.g.*, 16) having multiple axis motion capability. *See, e.g., id.* at page 3, paragraph 14; *see also* FIG. 1. The machine includes a three axis stage (*e.g.*, 18) for mounting the workpiece sample (*e.g.*, 14) for two-axis (*e.g.*, X, Y) precision translation and precision rotation (*e.g.*, A) relative thereto. The machine also includes an elevator (e.g., 20) on which is mounted a rotary spindle (*e.g.*, 22), shown in part, in which various milling machine tools may be interchanged for use in typical milling of workpieces. The spindle is replaced

with a rotary pen tip or nozzle (*e.g.*, 24) which is suitably rotatably mounted to the elevator (e.g., 20). *See, e.g., id.* at page 3, paragraph 15; *see also* FIG. 1. Means in the form of a dispenser (*e.g.*, 26) are suitably joined in flow communication with the pen tip (*e.g.*, 24) for ejecting desired material (*e.g.*, 12) in a stream atop the workpiece for writing thereon any suitable pattern of material under relative movement between the pen tip and the workpiece mounted to the stage (*e.g.*, 18). *See, e.g., id.* at page 3, paragraph 15; *see also* FIG. 1. The pen tip (*e.g.*, 24) is suitably mounted to the vertical elevator (*e.g.*, 20) for translation thereof in a third linear axis (*e.g.*, Z) which is orthogonal to the (*e.g.*, X and Y axes). The pen tip (*e.g.*, 24) is also mounted to the elevator for rotation in a second rotary axis (*e.g.*, B), which permits full 360 degree movement of the pen for reaching either the external surface of the workpiece (*e.g.*, 14), or the internal surface of a different hollow workpiece as desired. *See, e.g., id.* at page 3, paragraph 20; *see also* FIG. 1.

A benefit of the invention, as recited in these claims, is the use of a pen tip (*e.g.*, 24) preferably oriented obliquely and substantially perpendicular with the target surface of the workpiece on which the material stream is being deposited or written. In this way, the stream (*e.g.*, 12) may be ejected from the pen tip (*e.g.*, 24) directly atop the workpiece in a direct write deposition process. As the stream is dispensed from the pen tip, the workpiece (*e.g.*, 14) is moved by the supporting stage relative to the tip for writing or applying a line of the material atop the workpiece in any desired pattern. The resulting line or pattern of material is precisely located on the workpiece, with excellent control of its width and thickness. The arrangement may be used for any desired application in manufacturing, repairing, or alteration of workpieces for any desired purpose. *See, e.g., id.* at page 7, paragraph 38.

Additionally, the multi-axis robotic pen disclosed above in a preferred embodiment permits the writing pen tip (*e.g.*, 24) to be accurately positioned substantially normal to the writing surface of the workpiece irrespective of its changing

contour in three dimensions for precisely writing a material stream thereon in controlled thickness, position, and pattern. In the exemplary embodiment illustrated in Figure 2, the pen tip is positioned for writing upon the external surface of the exemplary workpiece. In alternate embodiments, the pen tip may be positioned for writing upon the internal surface of a hollow workpiece within the reach of the pen tip. *See, e.g., id.* at page 10, paragraph 54.

This is a clear difference and distinction from the prior art, as discussed below.

6. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Sole Ground of Rejection for Review on Appeal:

Appellants respectfully urge the Board to review and reverse the Examiner's sole ground of rejection in which the Examiner rejected claims 1-3, 11, and 24 under 35 U.S.C. 103(a) as being unpatentable over Ishida et al., (U.S. Patent 5,932,012, hereinafter "Ishida") in view of Barrey et al., (U.S. Patent 6,197,115, hereinafter "Barrey") and Chikahisa et al. (U.S. Patent 6,562,911, hereinafter "Chikahisa"). Claims 4-6, 12, 17-23, and 25-26 were objected to as being dependent upon rejected base claims.

7. ARGUMENT

As discussed in detail below, the Examiner has improperly rejected the pending claims. Further, the Examiner has misapplied long-standing and binding legal precedents and principles in rejecting the claims under Section 103. Accordingly, Appellants respectfully request full and favorable consideration by the Board, and reversal of the outstanding rejections. Appellants strongly believe that claims 1-6, 11-12, and 17-26 are currently in condition for allowance.

A. Ground of Rejection:

The Examiner rejected claims 1-3, 11, and 24 under 35 U.S.C. 103(a) as being unpatentable over Ishida in view of Barrey and Chikahisa.

Claims 1, 11, 24, and claims depending therefrom

The burden of establishing a *prima facie* case of obviousness falls on the Examiner. *Ex parte Wolters and Kuypers*, 214 U.S.P.Q. 735 (B.P.A.I. 1979). Obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention absent some teaching or suggestion supporting the combination. *ACS Hospital Systems, Inc. v. Montefiore Hospital*, 732 F.2d 1572, 1577, 221 U.S.P.Q. 929, 933 (Fed. Cir. 1984). Accordingly, to establish a *prima facie* case, the Examiner must not only show that the combination includes all of the claimed elements, but also a convincing line of reason as to why one of ordinary skill in the art would have found the claimed invention to have been obvious in light of the teachings of the references. *Ex parte Clapp*, 227 U.S.P.Q. 972 (B.P.A.I. 1985). When prior art references require a selected combination to render obvious a subsequent invention, there must be some reason for the combination other than the hindsight gained from the invention itself, i.e., something in the prior art as a whole must suggest the desirability, and thus the obviousness, of making the combination. *Uniroyal Inc. v. Rudkin-Wiley Corp.*, 837 F.2d 1044, 5 U.S.P.Q.2d 1434 (Fed. Cir. 1988).

The independent claims 1, 11, and 24 recite, in generally similar language, a robotic pen comprising a machine including a stage for mounting a workpiece for rotation and orthogonal translation. *The stage permits translation generally in a plane and is rotatable about an axis generally parallel to the plane.*

In the Final Office Action and the Notice of Panel Decision, the Examiner maintained the same rejections as formulated in the previous non-final Office Action. The Examiner argued Barrey discloses a stage or end "effector" for permitting translation generally in a plane and rotation about an axis generally parallel to the plane. Further, the Examiner contended that the multi-axis robot structure of Barry allows for the application of sealant to a surface that lies in 2 or more dimensional planes with a smooth and consistent motion, and therefore it would have been obvious to one of ordinary skill in

the art at the time of the invention to have used a robot stage as in Barrey for the X-Y table of Ishida in order to apply coatings such as sealant to a surface that lies in 2 or more dimensional planes. *See,* Final Office Action, page 3.

In response to Appellants arguments in the previous non-final Office Action, the Examiner also argued that the robot of Barrey has 6-axes of motion, and that such robots are well understood in the art as being capable of being moved to any point and angle, and inherently are capable of being moved such that it permits translation in a plane and rotation about an axis generally parallel to the plane.

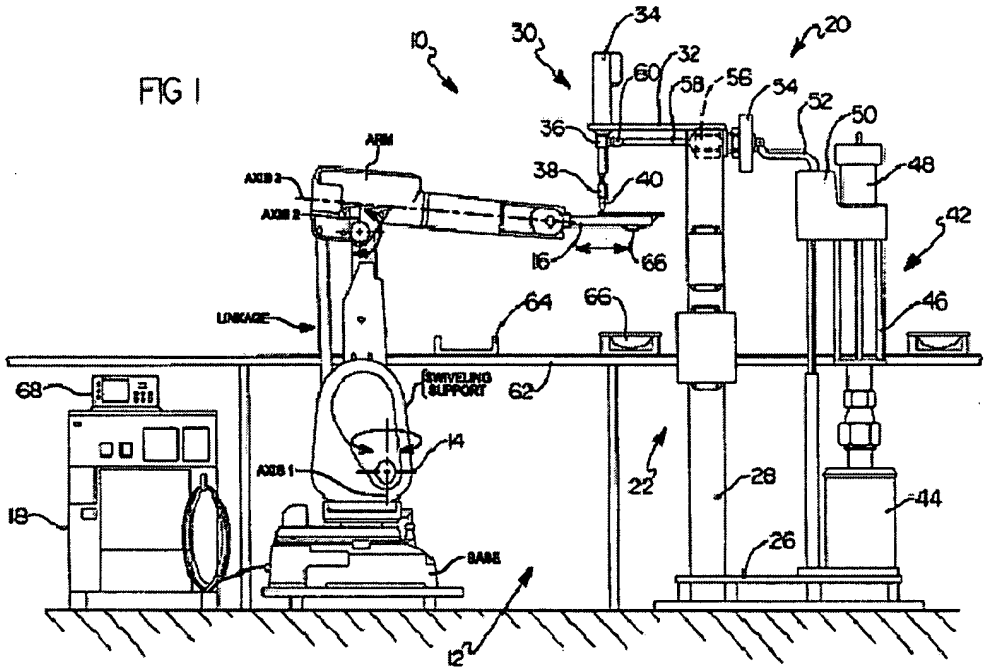
The Examiner's analysis is incorrect. The Examiner apparently based this overbroad statement on the abstract and a short passage of Barrey. The Examiner has not carefully considered how the robot described in Barrey actually works. Barry does disclose six axes of motion provided by the robotic manipulator. However, this fact alone is of no consequence; many such "six axis" robots exist that do not provide the robotic manipulator the type of motion claimed. Barry fails to disclose that the robotic manipulator is rotatable about an axis generally parallel to the translational plane.

An illustration of the translational plane and the rotational axis generally parallel to the translational plane is provided in FIG. 1 of the present application. As discussed in paragraph 18 of the application, the workpiece stage includes a first table for translating the workpiece in a first linear axis X, and a second table mounted atop the first table for translating the first table and workpiece in a second linear axis Y. The second axis Y is orthogonal to the first axis X for two-plane mounting and translation of the workpiece. As set forth in paragraph 19 of the application, the machine further includes a rotary spindle suitably mounted atop the first table for mounting the workpiece for precision rotation thereof in a first rotary axis A. *See, e.g., id.* at page 3, paragraph 18. It is clearly evident that the rotary axis A is parallel to the translation plane X-Y.

Because Ishida does not describe a stage that permits translation generally in a plane and rotation about an axis generally parallel to such a plane, the Examiner relied upon the teachings of Barrey. The rejection cannot stand if Barrey does not show a workpiece mounting stage that permits translation generally in a plane and rotation about an axis generally parallel to that plane.

Figure 1 of Barrey is reproduced below with certain annotations made by Appellants to facilitate the analysis advanced below.

FIG 1



Barrey describes a robotic manipulator 14 that supports a gripping tool 16. Barrey does not describe in any detail the particular motion of the components of the robotic manipulator, although these are key to understanding how the arrangement moved the gripping tool 16 (and any workpiece that would be positioned on the tool).

However, it is clear from FIG. 1 of Barrey that the robotic manipulator includes a base, a swiveling support that is rotatable about an axis of the base (labeled "axis 1" in the figure above), and an arm coupled via a linkage to the swiveling support. The arm may be raised or lowered about a horizontal axis (labeled "axis 2" in the annotated figure). The gripping tool is coupled to the arm. The gripping tool may be extended or retracted along a longitudinal axis (labeled "axis 3" in the figure).

However, Barrey fails to describe that the gripping tool is *rotatable about the longitudinal axis of the arm (i.e., axis 3)*. That is, the plane of translation of the gripping tool 16, following the recitations of the pending independent claims, would be the plane defined by the extension and retraction along axis 3 of the arm. No teaching is provided, however, that the tool can be rotated about that axis. Indeed, given the type of robotic device illustrated in Barrey, those skilled in the art would conclude that is it not intended to provide for rotation in this manner. Such rotation is apparently not an issue in Barrey, as the entire purpose of the arrangement is to spread an adhesive on a workpiece that is held on the (flat) gripping tool 16.

Because Barrey does not describe a workpiece mounting stage that permits translation generally in a plane and rotation about an axis generally parallel to the plane, and further because Ishida and Chikahisa do not obviate these deficiencies, the combination of teachings cannot support a *prima facie* case of obviousness of independent claims 1, 11, and 24. Thus, reversal of the rejections is requested. The claims depending directly or indirectly from these independent claims are also believed to be clearly patentable by virtue of their dependency from an allowable base claim, and for the subject matter they separately recite. Reversal of their rejections is also requested.

Conclusion

Appellants respectfully submit that all pending claims are in condition for allowance. However, if the Examiner or Board wishes to resolve any other issues by way of a telephone conference, the Examiner or Board is kindly invited to contact the undersigned attorney at the telephone number indicated below.

Respectfully submitted,

Date: 8/17/2006

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8. APPENDIX OF CLAIMS ON APPEAL

Listing of Claims:

1. A robotic pen comprising:

a machine including a stage for mounting a workpiece for rotation and orthogonal translation, the said stage permitting translation generally in a plane and rotation about an axis generally parallel to said plane, and an elevator for translation from said stage;

a pen tip rotatably mounted to said elevator;

a dispenser joined in flow communication with said pen tip for ejecting a stream of material atop said workpiece; and

a digital controller configured for coordinating relative movement of said pen tip and said stage, and dispensing of said stream from said pen tip.

2. A robotic pen according to claim 1 wherein said dispenser comprises:

a syringe for storing said material, and joined in flow communication with said pen tip; and

means for pumping said syringe to dispense material through said pen tip.

3. A robotic pen according to claim 2 wherein said controller is configured with a three dimensional geometry of said workpiece and a predetermined path for said pen tip thereacross.

4. A robotic pen according to claim 3 wherein:

said stage includes a first table for translating said workpiece in a first linear axis, a second table for translating said workpiece in a second linear axis orthogonal to said first linear axis, and a spindle for rotating said workpiece in a first rotary axis; and

said pen tip is mounted to said elevator for translation in a third linear axis orthogonal to said first and second linear axes, and for rotation in a second rotary axis

coordinated with said first rotary axis for orienting said pen tip obliquely with said workpiece.

5. A robotic pen according to claim 4 further comprising:

a vertical tube fixedly mounted thereto, and disposed in flow communication with said dispenser;

a tubular shaft fixedly mounted to said tube in flow communication therewith;

a manifold disk rotatably mounted around said shaft in flow communication therewith, and having said pen tip extending radially outwardly therefrom; and

means for rotating said disk on said shaft in said second rotary axis for positioning said pen tip relative to said spindle.

6. A robotic pen according to claim 5 wherein said disk rotating means comprise:

a first cog wheel joined to said disk, and rotatably mounted to said shaft;

a motor fixedly mounted to said elevator and including a second cog wheel mounted to an output shaft thereof; and

a cog belt joining together said first and second cog wheels.

11. A robotic pen comprising:

a computer numerically controlled machine including a stage for mounting a workpiece for rotation and orthogonal translation, the said stage permitting translation generally in a plane and rotation about an axis generally parallel to said plane, and an elevator for translation from said stage;

a pen tip rotatably mounted to said elevator; and

a dispenser joined in flow communication with said pen tip for ejecting a stream of material atop said workpiece.

12. A robotic pen according to claim 11 wherein:

said stage includes a first table for translating said workpiece in a first linear axis, a second table for translating said workpiece in a second linear axis orthogonal to said first linear axis, and a spindle for rotating said workpiece in a first rotary axis; and

said pen tip is mounted to said elevator for translation in a third linear axis orthogonal to said first and second linear axes, and for rotation in a second rotary axis coordinated with said first rotary axis for orienting said pen tip obliquely with said workpiece.

17. A robotic pen according to claim 12 wherein said elevator includes:

a vertical tube fixedly mounted thereto, and disposed in flow communication with said dispenser;

a tubular shaft fixedly mounted to said tube in flow communication therewith;

a manifold disk rotatably mounted around said shaft in flow communication therewith, and having said pen tip extending radially outwardly therefrom; and

means for rotating said disk on said shaft in said second rotary axis for positioning said pen tip relative to said spindle.

18. A robotic pen according to claim 17 wherein said disk rotating means comprise:

a first cog wheel joined to said disk, and rotatably mounted to said shaft;

a motor fixedly mounted to said elevator and including a second cog wheel mounted to an output shaft thereof; and

a cog belt joining together said first and second cog wheels.

19. A robotic pen according to claim 12 further comprising a digital controller configured for coordinating relative movement of said pen tip and said spindle in said first, second, and third linear axes and said first and second rotary axes.

20. A robotic pen according to claim 19 wherein said five axis controller is integral with said machine, and said machine is a pre existing milling machine modified by removing from said elevator the milling spindle thereof and replaced by said pen tip rotatably mounted thereto.

21. A robotic pen according to claim 19 wherein said controller is configured with a three dimensional geometry of said workpiece and a predetermined path for said pen tip thereacross.

22. A robotic pen according to claim 12 wherein said dispenser comprises:

a syringe for storing said material, and joined in flow communication with said pen tip; and

means for pumping said syringe to dispense material through said pen tip.

23. A robotic pen according to claim 22 further comprising means for coordinating dispensing of said material from said dispenser with relative movement between said pen tip and workpiece to control flow rate of said stream from said pen tip.

24. A robotic pen comprising:

a machine including a stage for mounting a workpiece for rotation and orthogonal translation, the said stage permitting translation generally in a plane and rotation about an axis generally parallel to said plane, and an elevator for translation from said stage;

a pen tip rotatably mounted to said elevator for rotation about an axis generally parallel to said plane;

a dispenser joined in flow communication with said pen tip for ejecting a stream of material atop said workpiece; and

a digital controller configured for coordinating relative movement of said pen tip and said stage, and dispensing of said stream from said pen tip.

25. A robotic pen according to claim 24 wherein:

said stage includes a first table for translating said workpiece in a first linear axis, a second table for translating said workpiece in a second linear axis orthogonal to said first linear axis, and a spindle for rotating said workpiece in a first rotary axis; and

said pen tip is mounted to said elevator for translation in a third linear axis orthogonal to said first and second linear axes, and for rotation in a second rotary axis coordinated with said first rotary axis for orienting said pen tip obliquely with said workpiece.

26. A robotic pen according to claim 25 further comprising:

a vertical tube fixedly mounted thereto, and disposed in flow communication with said dispenser;

a tubular shaft fixedly mounted to said tube in flow communication therewith;

a manifold disk rotatably mounted around said shaft in flow communication therewith, and having said pen tip extending radially outwardly therefrom; and

means for rotating said disk on said shaft in said second rotary axis for positioning said pen tip relative to said spindle.

9. EVIDENCE APPENDIX

None.

10. RELATED PROCEEDINGS APPENDIX

None.